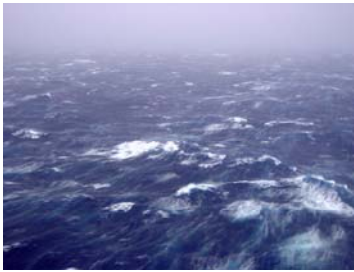# Atlantic Oceanographic and Meteorological Laboratory
Specializing in hurricanes and open and coastal ocean research

Coral monitoring (CREWS) station in the US Virgin Islands

The ocean below Hurricane Isabel as viewed from a hurricane hunter plane

NOAA's Gulfstream 4 jet used in AOML synoptic surveillance research missions

1315 East West Highway
Silver Spring, MD 20910
(301) 713-1671
www.oar.noaa.gov

What does the Atlantic Oceanographic and Meteorological Laboratory do for the nation?

With an estimated 40 million Americans living in coastal regions of the Eastern United States, it is essential that we understand how the human population affects the oceans and the role the ocean plays in our lives. Human-related discharges ranging from wastewater to increased levels of freshwater run-off can significantly affect the coastal marine ecosystems we depend on economically. The temperature and rate at which ocean water circulates directly relates to global climate and long-term weather patterns. The gradual north and south oscillation of warm waters in the Atlantic is strongly linked to increased or decreased hurricane activity.

Scientists at the Atlantic Oceanographic and Meteorological Laboratory (AOML) study the relationships between ocean and atmosphere by conducting research in both near shore and open ocean environments. They cooperate with other federal, state, and local authorities to maximize research knowledge for use in economically and environmentally important projects. AOML also provides and interprets oceanographic data collected via ships, satellites, drifting buoys and floats, and conducts research relevant to annual-to-decadal climate change and coastal ecosystems. This research includes the dynamics of the ocean, its interaction with the atmosphere, and its role in climate and climate change. AOML research improves the understanding and prediction of hurricane motion, intensity change, and the impacts from wind, surge, waves, and rain. A key to this work is the annual hurricane field program, supported by the NOAA Aircraft Operations Center research/reconnaissance aircraft.

Recent Accomplishments:

- AOML addresses the problem of rapid hurricane intensification through analysis of detailed airborne observations of the atmospheric boundary layer and upper ocean. Through a partnership with NOAA/NESDIS, AOML created the only operational statistical-dynamical intensity model, known as SHIPS, which recently incorporated a new understanding of ocean heat content. ***Payoffs: The forecast system currently has limited skill in predicting rapid intensification, which can transform tropical storms into an engine of devastation overnight. Timely warning of rapid intensification ahead of an impending landfall is the key to mitigation of the inevitable large-scale property damage and prevention of extensive mortality.***

- Through time-series observations, AOML characterized properties of the Meridional Overturning Circulation in the Atlantic. This circulation is responsible for heat and mass transport from the southern hemisphere to the northern hemisphere. ***Payoffs: The data are a critical component of the climate forecast activities and used to initialize models that have been shown to be of great economic benefit both to the nation and the international community.***

- AOML is a principal player in the NOAA/OGP Carbon Cycle Science Program, and with NOAA/PMEL and university research partners, determined the first inventory of anthropogenic CO_2 in the ocean based on observations, as opposed to models. ***Payoffs: The findings are critical for national and international assessments of the long-term fate of anthropogenic CO_2, such as the Intergovernmental Panel on Climate Change report. The monetary value the annual sequestration of 2 Pg C by the ocean equates to a $ 4 billion dollar "service".***

- AOML capitalizes on internal collaborations, describing new understandings of the direct relationship between multiple decadal fluxuations in North Atlantic sea surface temperatures and seasonal hurricane activity*. **Payoffs: These insights provide new variables to be considered in seasonal hurricane forecasting, a product of increasing interest and utility as the coastal population continues to boom in the United States and more citizens are affected by hurricanes.***

- AOML continues to publish new understandings of hurricane dynamics and structure through innovative use of instruments and data collected in the hurricane field program. ***Payoffs: These findings lead to improved model resolution, which directly improves the quality and accuracy of forecasts for the National Weather Service.***

What's next for AOML?

AOML will conduct increasingly interdisciplinary research with stronger links between the three major laboratory themes: oceans and climate, regional and coastal ecosystems, and tropical meteorology and with even stronger links to the other NOAA line organizations -e.g., a joint emphasis with the National Marine Fisheries Service on Fisheries Oceanography. AOML has a firmly established role as leader in research in all three areas, particularly for research focused in the Atlantic Ocean, including the Intra-Americas Sea (Caribbean and Gulf of Mexico) and Florida coastal areas. AOML is the custodian of major oceanographic and hurricane data sets and is a center for their dissemination. In addition to continuing work, general new avenues that are emerging include:

- Model systems for assisting regional coastal infrastructure authorities (state or regional) in meeting societal needs regarding water resources and marine transportation;
- Explicit integration with our regional line organization partners in responding to South Florida Ecosystem Restoration implementation;
- Expanded use of advanced technologies and innovative cost-effective sampling platforms;
- Integration of AOML observing systems into regional, national and international observation systems; and,
- More sophisticated representations of the ocean in coupled ocean-atmosphere models to meet goals for improved tropical cyclone intensity forecasts.

Research Partnerships:

AOML has long-standing research partnerships with all components of NOAA; many universities, especially the University of Miami; numerous other federal agencies including EPA, Army Corps of Engineers, NASA, and the Office of Naval Research; regional agencies such as the South Florida Water Management District; and several foreign research organizations (e.g., IFREMER, the French Oceanographic Research Institute)

Budget and Staff

The FY 2003 enacted budget for the AOML budget lines totaled $12.8M, and its requested budget for FY 2004 totaled $14.2M. As FY04 begins, AOML will have 96 federal employees, 8 contractors, and 46 Joint Institute employees.

For more information, contact:
Dr. Peter Ortner, Acting Director
4301 Rickenbacker Causeway
Miami, FL 33149
(305) 361-4300
http://www.aoml.noaa.gov